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Bacteriological Profile of Catheter Associated Urinary Tract Infection and its Antimicrobial Susceptibility Pattern in a Tertiary Care Hospital.

Nandini. M.S[*], Kiran Madhusudan[**]

[*]*Post graduate, Department Of Microbiology ,Sree Balaji medical college and hospital,*
[**]*Professor, Department Of Microbiology, Sree Balaji medical college and hospital, Chennai- 88.*

Abstract:

Among nosocomial infections catheter associated urinary infection (CAUTI) is one of the most common infection. Uro-pathogens isolated from CAUTI were more multi-drug resistant than from community acquired urinary tract infection (UTI). Hence the aim of this study is to isolate uro- pathogens from CAUTI and find out anti microbial sensitivity pattern among the isolates.

Materials and methods:

A prospective study was conducted from July 2015 to Jan 2016, urine samples were collected from 250 patients with CAUTI which were processed microbiologically and antimicrobial sensitivity was performed.

Results:

Out of 250, 54 patients developed CAUTI and Escherichia coli (34.61%) was the most common organism followed by Klebsiella (21.15%), Pseudomonas (17.30%), Proteus (7.69%) and Acinetobacter (9.61%). Among the Gram positive isolates Staphylococcus aureus and Enterococcus was isolated and MRSA strains were 66.67%. Enterobacteriaceae showed high resistant to commonly used antimicrobials Gentamycin, Ceftriaxone, Ofloxacin, ciprofloxacin and were highly sensitive to Amikacin, ceftazidime, pipercillin tazobactum, imepenem, Meropenem. ESBL producers among Gram negative bacilli were 11(23.40%).

Conclusion:

34(62.96%) Patients developed CAUTI on 7th day of catheterization and many isolates showed multi- drug resistance pattern, hence strict aseptic precaution has to be taken prior to catheter insertion and care after to prevent infection.

Key words: CAUTI, nosocomial, uro pathogens, MRSA, ESBL.

INTRODUCTION:

Catheter associated urinary infections accounts to more than 80% of hospital acquired infections [1]. 15- 25% of hospitalized patients are catheterized for one or the other reasons. CAUTI is responsible for 20-30% of HAIs in surgical and medical ICUs (Richards *et al.,* 1999) [2] and accounts for significant mortality morbidity and increased hospitalization cost [3]. Among organism causing CAUTI, Escherichia coli, Klebsiella, Enterococci, Enterobacter, and Proteus are common pathogens that colonize urinary catheters. Psuedomonas aeruginosa, Staphylococcus aureus, Acinetobacter are environmental organisms causing healthcare associated CAUTI, due to inadequate aseptic precautions during insertions and maintenance of urinary catheters by health care workers [4]. Inappropriate use of antimicrobial agents has led to increase in emergence of multi drug resistant uropathogens and therefore increased risk of mortality in ICUs [5].

AIMS & OBJECTIVES:

To find out organisms causing catheter associated urinary tract infection, and to find out antimicrobial sensitivity pattern among the isolates. To detect Methicillin resistant strains among Staphylococcus aureus and ESBL producers among Gram negative isolates.

MATERIALS & METHODS:

A cross sectional study was done from July 2014 to Jan 2016, about 250 urine samples were collected from patients who were catheterized, according to CDC guidelines using sterile needle from tubing of catheter under aseptic precautions.

Inclusion criteria:

All patients who were catheterized were included in the study.

Exclusion criteria:

1. Patients who were earlier treated with UTI were excluded.
2. Patients already suffering from cystitis and prostatic enlargement.
3. Patients on suprapubic catheter, nephrostomy tube and condom catheter were excluded.

Samples were collected on first day of catheterization, later 3rd, 5th, 7th, 9th, and 11th day. First day sample was collected and processed to rule out prior urinary tract infection. The samples were processed on Mac conkey agar, Blood agar and CLED by using standard calibrated loop. Samples which had colony count $\geq 10^5$CFU/ml were processed further for biochemical reactions and antimicrobial sensitivity. Antimicrobial sensitivity was done on Muller Hinton agar according to CLSI guidelines antimicrobial sensitivity pattern was recorded [6]. Staphylococcus aureus

ATCC 25923, E. coli ATCC 25922 and P. aeruginosa 25873 were used as control strains.

Extended spectrum beta lactamase detection

The screening for extended spectrum beta lactamase (ESBL) was done using ceftriaxone (≤25 mm), ceftazidime (≤22 mm), cefotaxime (≤27 mm), cefpodoxime (≤22 mm), and aztreonam (≤27 mm). Escherichia coli ATCC 25922 were used as an ESBL-negative and Klebsiella pneumoniae 700603 was used as an ESBL-positive reference strain. ESBL positivity was suspected, if the organism showed zone of inhibition less than minimum for any antibiotic disc. The strain was tested against ceftazidime/clavulanic acid and ceftazidime for phenotypic confirmation. A zone of inhibition for ceftazidime/clavulanic acid 5-mm more than zone of inhibition for ceftazidime was considered indicative of ESBL production [6].

Detection of Methicillin Resistance

Methicillin resistance in Staphylococcus aureus isolates were tested by using cefoxitin disc (30µ) by disc diffusion method. Strains with a zone of diameter of ≤ 19mm was considered resistant to cefoxitin[7]. Staphylococcus aureus ATCC 25923 strains were used as control for methicillin sensitive S. aureus (MSSA) and ATCC 43300 were used for methicillin resistant S. aureus (MRSA) [8].

RESULTS:

Out of 250 patients, 54 of them developed CAUTI and incidence of CAUTI was 21.6%.Out of them 33(61.11%) were male and 16(29.62%) were female patients. 34(62.96%) of patients developed CAUTI on the 7th day of catheterization. Escherichia coli were the most common organism 18(34.61%), followed by Klebsiella 11(21.15%), Pseudomonas 9(17.30%), Proteus 4(07.69%), Acinetobacter 5 (09.61%) table 1. Gram negative bacilli were more predominant than Gram positive cocci. Among Gram positive cocci, Staphylococcus aureus and Enterococci were isolated, which showed high resistance to fluoroquinolones, cephalosporins and 100% susceptibility to linezolid and vancomycin. Enterococci were not tested for penicillins and cephalosporins as they are intrinsically resistant to these antimicrobials; their sensitivity pattern is shown in table 2. Methicillin resistant strains among Staphylococcus aureus were 66.67%. Out of 47 Gram negative bacilli, 11(23.40%) of them were ESBL positive.

DISCUSSION:

Out of 250 patients 54 developed catheter associated urinary infection, incidence of CAUTI is 21.6%, which was similar to earlier studies by Kulkarni et al [9], Bagchi et a l[10], N Bhatia et al [11]. Male predominance was seen in CAUTI, male 33(61.11%) than female 16(38.88%) patients, similar male preponderance were reported by Jaggi et al [12]. Patients were followed upto 11 days post catheterisation, and was found that 34(62.96%) patient developed CAUTI after 7 days of catheter insertion, which correlated with earlier studies by kulkarni et al[9] and Bagachi et al[10]. Duration of catheterization is strongly associated with CAUTI, hence proper maintainence and care of catheter is required to reduce the incidence of CAUTI. Among the uropathogens isolated from CAUTI Gram negative bacilli were predominant than Gram positive cocci. Escherichia coli was the most common organism 18 (34.61%) followed by Klebsiella 11 (21.15%), Pseudomonas 9 (17.30%), Proteus 4 (7.69%) (table1). This finding was comparable to the studies conducted by Bagachi et al [10], Kazi et al [13], Jayashri et al [14]. Staphylococcus aureus and Enterococci were Gram positive organism isolated from CAUTI. Staphylococcus aureus showed Methicillin resistant 52.31%, which was similar to study by Neha garg et al (66.6%) [15] and Anupurba *et al,* (54.85%) [16].

Enterobacteriaceae showed multidrug resistant, earlier studies (13, 17, 18) also showed similar results. Higher resistant were found for fluoroquinolones which is the commonly used drug for urinary tract infection. Pseudomonas and Proteus species showed 100% sensitivity for imipenem, meropenem, ceftazidime, and ceftazidime - clavulanic acid, and pipercillin - tazobactum combination. ESBL positive were 11 (23.40%) among 47 Gram negative isolates, which correlates to study by Neha garg et al (25%) [15].

CONCLUSION:

Incidence of CAUTI increases with the duration of catheterisation, many uropathogens isolated from CAUTI showed multi drug resistance. Hence strict aseptic precaution has to be taken while insertion and daily catheter care to reduce CAUTI. If antimicrobials started according to culture and sensitivity pattern, inappropriate use of antimicrobials can be reduced.

Table 1: Organisms isolated from urine of catheterized patients

Organisms	Total isolates-n	Percentage%
Escherichia coli	18	34.61
Klebsiella sps	11	21.15
Pseudomonas sps	09	17.30
Acinetobacter sps	05	09.61
Proteus sps	04	07.69
Staphylococcus aureus	03	05.76
Enterococcus sps	02	03.84
Candida sps	02	03.84

Table 2: Antibiotic sensitivity pattern of Gram positive organisms

Antimicrobials	Staphylococcus aureus % (n-3)	Enterococcus sps %(n-2)
Amoxycillin clavulanic acid	66.66	---
Co-trimoxazole	33.33	----
Cephalexin	33.33	----
Ofloxacin	66.66	50
Levofloxacin	66.66	50
Azithromycin	33.33	50
Erythromycin	33.33	50
Vancomycin	100	100
Linezolid	100	100
Norfloxacin	33.33	00
Cefriaxone	66.66	---
Cefixime	33.33	---
Gentamycin	33.33	---
Cefuroxime	66.66	---
Cefoxitin	33.33	---

Table3: Antimicrobial sensitivity pattern of Gram negative bacilli.

Antimicrobials	E. coli %	Klebsiella %	Pseudomonas %	Acinetobacter%	Proteus%
Ofloxacin	42.10	68.46	33.33	60	75
Levofloxacin	56.02	55.7	55.55	80	50
Ciprofloxacin	12.70	43.69	22.22	20	25
Amikacin	36.77	58.62	66.66	40	50
Gentamycin	82.38	60.32	33.33	20	50
Ceftriaxone	76.07	87.33	66.66	40	50
Cefixime	46.20	33.23	44.44	20	25
Cefotaxime	67.27	87.80	65.32	40	25
Ceftazidime	74.57	76.77	77.77	80	100
Ceftazidime-clavulinic acid	90.32	89.28	88.88	100	100
Pipercillin tazobactum	34.70	89.37	100	80	100
Imepenem	100	99.32	100	100	100
Meropenem	100	97.6	100	100	100

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